इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 15226 (2002): Rigid Polyvinyl Chloride (PVC) Compounds
[PCD 12: Plastics]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

भारतीय मानक

दृढ़ पोलिविनाइल (पीवीसी) यौगिक — विशिष्टि

Indian Standard

RIGID POLYVINYL CHLORIDE (PVC) COMPOUNDS — SPECIFICATION

ICS 83.080.20

© BIS 2002

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 2002

Price Group 5

Plastics Sectional Committee, PCD 12

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Rigid polyvinyl chloride (PVC) compounds consist of PVC or a copolymer of vinyl chloride or both, suitably compounded with additives. General properties, common to all members of PVC group, include excellent water and chemical resistance, strength, abrasion resistance and unlimited colour possibilities ranging from crystal clear to black opaque. The rigid PVC compounds are processed by techniques, such as injection moulding, blow moulding, extrusion, calendering, vacuum forming, etc.

This standard deals only with rigid PVC compounds and major applications include pipes, pipe fittings, profiles, sheets, bottles, containers, etc. Flexible PVC compounds which are predominantly used for cables, footwear, tubes and films are separately covered under IS 9766:1992 'Flexible PVC compounds—Specification'.

The composition of the committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RIGID POLYVINYL CHLORIDE (PVC) COMPOUNDS — SPECIFICATION

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for rigid polyvinyl chloride (PVC) compounds.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

3.1 For the purpose of this standard definition given in IS 2828 and the following shall apply.

3.2 Rigid Polyvinyl Chloride Compound—A compound consisting of polyvinyl chloride, suitably compounded with other ingredients like stabilizers, lubricants, pigments, etc, to facilitate processing and to impart desired properties and colour to the end product.

4 DESIGNATION

4.1 The designation system given in **4.2** into which rigid polyvinyl chloride compounds are classified according to form of compound, method of processing, their designatory properties, such as Vicat Softening temperature, impact strength, tensile strength and flexural modulus. The designation system is only intended to indicate a broad classification and in most circumstances specific values of the designatory properties and other characteristics as given in **6** shall be used.

4.2 The designation shall consist of following information given in the order presented and shall be codified in different blocks as indicated below:

Block 1	For Indian Standard
Block 2	Identification for form of the compound
Block 3	Method of processing or intended application
Block 4	Designatory properties
Block 5	Additional information

The blocks shall be separated from each other by hyphen (-). If a block is not used, this shall be indicated by doubling the separation sign, that is, by two hyphens (- -).

For additional information, a fifth data block may be used. The kind of information and its code are not covered in this standard.

4.3 Block 1

For Block 1, the number and year of this Indian Standard shall be indicated.

4.4 Block 2

In this block, the form of the compound is specified as given below:

Dry blend or powder — D
Granules or chips — G

4.5 Block 3

In this block, information about method of processing or intended application is given. The codes for the same are specified in Table 1.

In case the compound is to be used in manufacturing products of foodstuffs, pharmaceuticals and drinking water, the description code will be followed by '-m'. For example B -m means moulding compound to be used in manufacturing a product for medical and/or food and/or drinking water contact application.

Table 1 Codes Used in Block 3
(*Clause* 4.5)

Sl No. (1)	Code (2)	Description (3)
i)	B	Blow moulding
ii)	C	Calendering
iii)	E	Extrusion of profiles
iv)	F	Extrusion of film
v)	I	Injection moulding
vi)	P	Extrusion of pipes
vii)	Q	Compression moulding
viii)	S	Extrusion of sheets
ix)	X	No indication

4.6 Block 4

In this block, the designatory properties are coded and are separated from each other by a hyphen. First the range of the Vicat Softening temperature is coded by three digits (*see* **4.6.1**) then followed by ranges of impact strength (Charpy notched) (*see* **4.6.2**), tensile strength (*see* **4.6.3**) and flexural modulus (*see* **4.6.4**) each coded by one digit.

If a property value falls on or near a cell limit, the manufacturer shall state which cell will designate the material. If subsequent individual test values lie on, or either side of, the cell limit because of manufacturing tolerances, the designation is not affected.

4.6.1 The Vicat Softening temperature shall be determined according to IS 13360 (Part 6/Sec 1)/ ISO 304 (Method B) and coded by three digits, as specified in Table 2.

4.6.2 The impact strength (Charpy method) shall be determined according to IS 13360 (Part 5/Sec 5)/ ISO 179 and the test specimens prepared according to Annex B and coded by one digit, as specified in Table 2.

4.6.3 The tensile strength shall be determined according to IS 13360 (Part 5/Sec 1)/ISO 527-1 and the test specimens prepared according to Annex B and coded by one digit, as specified in Table 2.

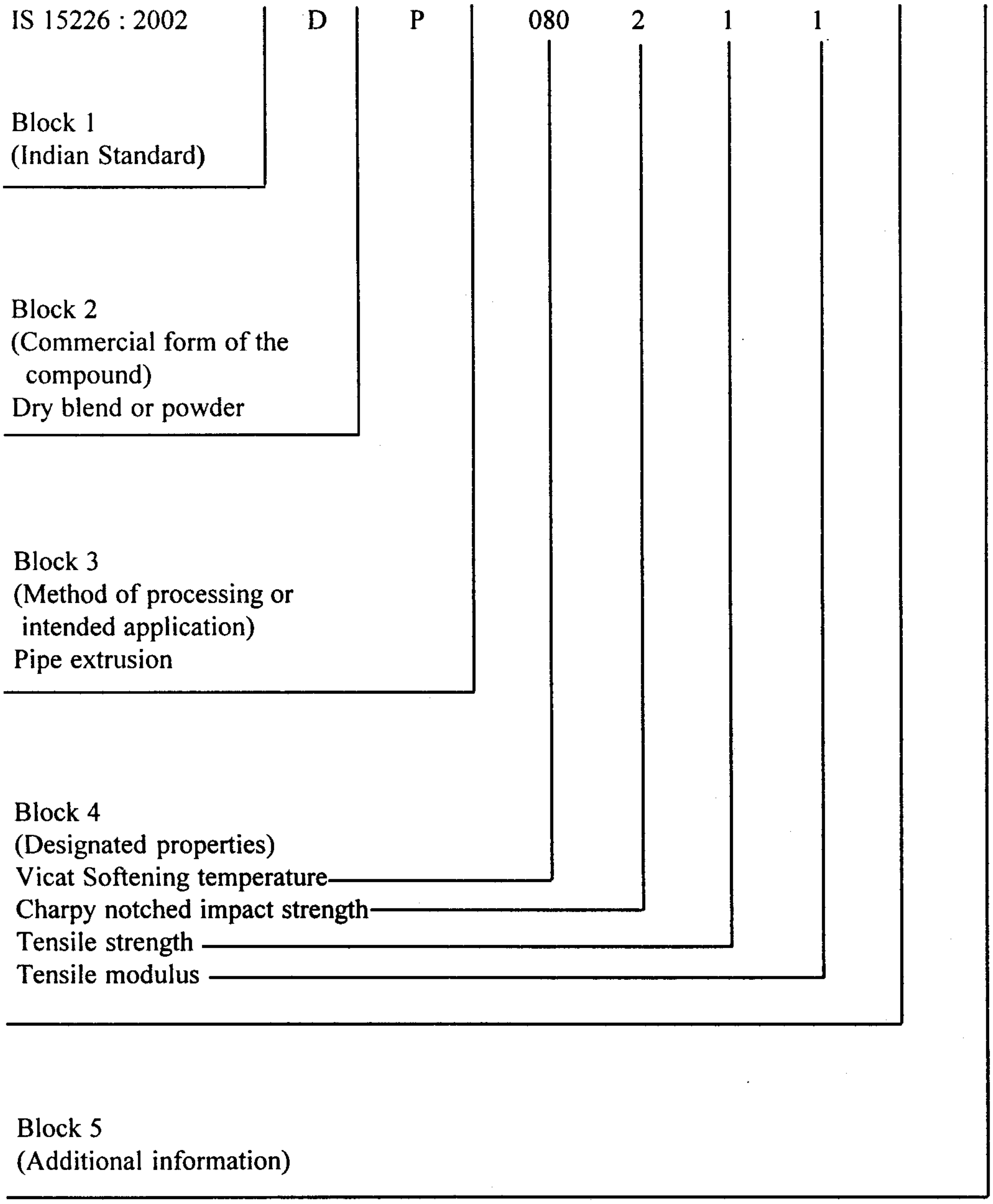
4.6.4 The flexural modulus shall be determined according to either IS 13360 (Part 5/Sec 1)/ ISO 527-1 or IS 13360 (Part 5/Sec 7)/ISO 178 and the test specimens prepared according to Annex B and coded by the letter T (tension); IS 13360 (Part 5/Sec 1)/ISO 527-1, or F (flexural); IS 13360 (Part 5/Sec 7)/ISO 178 and one digit, as specified in Table 2.

Table 2 Cell Codes and Their Ranges in Block 4
(*Clauses* 4.6.1, 4.6.2, 4.6.3, 4.6.4, 6.6, D-3.2, D-4 *and* D-5)

Vicat Softening Temperature, °C (1)	Code (2)	Impact Strength kJ/m² (3)	Tensile Strength MPa (4)	Flexural Modulus MPa (5)
Three digits for the Vicat Softening temperature (for example 078 for a value of 78°C with a tolerance of ± 2°C)	0	Unspecified	Unspecified	Unspecified
	1	≤ 5	≤ 35	≤ 2 000
	2	> 5 to 10	> 35 to 45	> 2 000 to 2 500
	3	> 10 to 20	> 45 to 55	> 2 500 to 3 000
	4	> 20	> 55	> 3 000

5 CODING EXAMPLE

An unplasticized PVC compound, having the physical form of dry blend (D), for the extrusion of pipes (P), with a Vicat Softening temperature VST/B/50 of 80°C (080), Charpy notched impact strength of 7 kJ/m² (2), tensile strength of 30 MPa (1) and a flexural modulus of elasticity of 1 400 MPa (1) would be designated as:



Designation : IS 15226 : 2002 –D–P–080–2–1–1

6 MATERIAL

6.1 Resin

The properties of the resin used in manufacturing the compound shall meet the requirements stipulated in the end product specification. In case where the end product specifications are not available or the specification does not describe the requirements with respect to resin properties, the requirements will be as mutually agreed upon by the manufacturer and user of the compound. The resin properties (K-value) shall be reported in accordance with IS 4669.

NOTE—In case the compound is to be used in manufacturing products of foodstuffs, pharmaceuticals and drinking water, it shall conform to the requirements prescribed in IS 10151.

6.2 Additives

Additives shall be used to facilitate processing and impart desired properties and colour in the end product for compounding PVC. These additives shall meet the requirements of the end product wherever specified.

6.3 Form

The compound shall be in the form of random cut chips, regular cubes, regular cylindrical pellets, powder or any other convenient form.

6.4 Appearance

The compound shall be free from foreign matter and uniform in colour. It may be of any colour. The colour of the sheet moulded in accordance with Annex B shall be taken as the colour of the compound.

6.5 Colour

6.5.1 *Fastness to Daylight Exposure*

The colour fastness shall be rated at not less than standard 4 when the compound is tested in accordance with ASTM D 2565-92 a 'Practice for operating xenon arc-type light—Exposure apparatus with and without water for exposure of plastics'.

6.5.2 *Colour Bleeding*

There shall be no staining or marking of the test sheet or of the filter paper when it is tested in accordance with IS 13360 (Part 9/Sec 4)/ISO 183.

6.6 Physical and Other Properties

When the compound is tested in accordance with the appropriate test methods as mentioned in **4.6**, the results of each type of compound shall fulfil the corresponding requirements as shown in Table 2.

6.7 Ash Content

When the compound is tested in accordance with the method prescribed in Annex C, the ash content of each type of compound shall not exceed 12 percent.

7 PACKING AND MARKING

7.1 Packing

The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

7.2 Marking

The container shall be marked with the following information:

a) Mass of the material;
b) Name of the manufacturer and his trade-mark, if any;
c) Class and type of material; and
d) Batch or lot number.

7.2.1 *BIS Certification Marking*

7.2.1.1 The containers may also be marked with the Standard Mark.

7.2.1.2 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 SAMPLING

The representative samples of the material shall be drawn and the criteria for conformity determined as prescribed in Annex D.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
2828:2001/ ISO 472:1999	Plastics—Vocabulary (*first revision*)
4669:1968	Methods of test for polyvinyl chloride resins
4905:1968	Methods for random sampling
10151:1982	Specification for polyvinyl chloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
13360	Plastics—Methods of testing:
(Part 5/Sec 1): 1996/ISO 527-1:1993	Part 5 Mechanical properties, Section1 Determination of tensile properties—General principles
(Part 5/ Sec 5): 1996/ISO 179: 1993	Part 5 Mechanical properties, Section 5 Determination of Charpy impact strength
(Part 5/Sec 7): 1996/ISO 178: 1993	Part 5 Mechanical properties, Section 7 Determination of flexural properties
(Part 6/ Sec 1): 1999/ISO 304: 1994	Part 6 Thermal properties, Section 1 Determination of Vicat Softening temperature of thermoplastics materials (*first revision*)
(Part 9/ Sec 4): 1997/ISO 183: 1976	Part 9 Optical properties, Section 4 Determination of colour bleeding

ANNEX B

(*Clauses* 4.6.2, 4.6.3, 4.6.4 *and* 6.4)

PREPARATION OF MOULDED TEST SHEET FROM RIGID PVC COMPOUNDS

B-1 PROCEDURE

B-1.1 Unless the compound is in the form of sheet, it shall be sheeted by milling at a suitable temperature which shall be the Vicat Softening temperature [*see* IS 13360 (Part 6/Sec 1)/ISO 304] plus 90°C before the moulding operation is carried out. The milling time shall be 5 to 10 min to form the material into a continuous homogenous sheet with optimum dispersion of all material component. When the compound is in the form of sheet, it may be moulded without resheeting.

B-1.2 A test sheet of any convenient area shall be moulded to a thickness of 1.25 ± 0.15 mm.

B-1.3 The moulding conditions shall be those recommended by manufacturer of the material. If these recommendations are not available, the test sheet shall be moulded at a temperature approximately 100°C excess of Vicat Softening temperature [*see* IS 13360 (Part 6/Sec 1)/ISO 304].

B-1.4 In preparing a test sheet or series of test sheets from a given batch of material, the moulding temperatures shall not vary by more than ± 2°C. The moulding cycle shall consist of preheating in the press at full moulding temperatures under pressure of 0.5 to 1 MPa for a period of 5 min, followed by the application of a pressure between 5 and 10 MPa for 2 to 5 min. Cool the mould to approximately 40°C, while maintaining constant applied pressure.

ANNEX C

(*Clause* 6.7)

DETERMINATION OF ASH CONTENT

C-1 OUTLINE OF THE TEST METHOD

The material is ashed in a muffle furnace.

C-2 APPARATUS

C-2.1 Porcelain Crucible

C-2.2 Weighing Balance

C-2.3 Muffle Furnace

C-2.4 Desiccator

C-3 PROCEDURE

Weigh accurately about 1 to 2 g of the test sample in a porcelain crucible of about 30 ml capacity, tared to constant weight after ignition at about 800°C in a muffle furnace for 2 h. After ignition, cool the crucible to room temperature in a desiccator and weigh to a constant mass.

C-4 CALCULATION

$$\text{Ash content, percent by mass} = \frac{(C-A)}{(B-A)} \times 100$$

where

A = mass in g of the empty crucible,

B = mass in g of the crucible with the sample, and

C = mass in g of the crucible with residue after ignition.

ANNEX D

(*Clause* 8)

METHODS OF SAMPLING OF RIGID PVC COMPOUNDS

D-1 GENERAL

D-1.1 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

D-1.2 Samples shall not be taken in an exposed place.

D-1.3 The sampling instrument shall be made of stainless steel or any other suitable material on which the material shall have no action. The instrument shall be clean and dry.

D-1.4 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

D-1.5 The samples shall be placed in a suitable, clean, dry, air-tight metal or glass containers on which the material has no action. The sample containers shall be of such a size that they are almost completely filled by the sample.

D-1.6 Each sample container shall be sealed air-tight with a stopper after filling and marked with full details of sampling, such as the date of sampling, the month and year of manufacture of the material, etc.

D-1.7 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

D-2 SCALE OF SAMPLING

D-2.1 Lot In a single consignment all the containers of the same class, type, form and belonging to the same batch of manufacture shall be grouped together to constitute a lot. If a consignment is known to consist of containers belonging to different batches of manufacture or different forms, the containers belonging to the same batch of manufacture and same form shall be grouped together and each such group shall constitute a lot.

D-2.2 For ascertaining the conformity of the material to the requirements of this specification, samples shall be tested from each lot separately. The number of containers to be sampled shall depend on the size of the lot and shall be in accordance with col 1 and 2 of Table 3.

Table 3 Scale of Sampling

(*Clauses* D-2.2, D-3.2 *and* D-4)

Sl No. (1)	Lot Size (2)	No. of Containers (3)
i)	Up to 15	3
ii)	16 to 50	4
iii)	51 to 100	5
iv)	101 to 300	7
v)	301 to 500	10
vi)	501 to 1 000	15
vii)	1 001 and above	20

D-2.2.1 These containers shall be selected at random from the lot and in order to ensure the randomness of selection, procedure given in IS 4905 may be followed.

D-3 PREPARATION OF TEST SAMPLES

D-3.1 A suitable sampling instrument made of stainless steel shall be used for this purpose. It shall be capable of taking samples from all points when inserted into the container.

D-3.2 From each of the containers selected, small portions of the material shall be drawn with the help of this sampling instrument. The total quantity of material collected from each container shall be sufficient to make triplicate determinations for each of the characteristics given in Table 2.

D-3.3 Out of these portions, a small but approximately equal quantity of material shall be taken and mixed thoroughly to form a composite test sample. The composite test sample thus formed shall be divided into three equal parts and transferred to separate bottles which are then sealed air-tight and labelled with all the particulars of sampling given in **D-1.6**. One of these bottles shall be marked for the purchaser, another for the supplier and third for the referee.

D-3.4 Referee sample shall consist of the composite test sample marked for the purpose and shall bear the seals of the purchaser and the supplier. It shall be used in case of any dispute between the two.

D-4 NUMBER OF TESTS

Tests for determining all the characteristics given in Table 2 shall be carried out on the composite test samples.

D-5 CRITERIA FOR CONFORMITY

The lot shall be declared as conforming to the requirements of this specification if each of test results on the composite sample satisfies the corresponding requirement given in Table 2 as appropriate.

ANNEX E

(Foreword)

COMMITTEE COMPOSITION

Plastics Sectional Committee, PCD 12

Organization	*Representative(s)*
Internet Exchange Limited, Mumbai	Shri Sarup Chowdhary (***Chairman***)
All India Plastics Manufacturers Association, Mumbai	Shri R. K. Aggarwal Shri K. B. Easwaran (*Alternate*)
Amines and Plasticizers Ltd, Mumbai	Shri V. V. Kulkarni Dr R. V. Utekar (*Alternate*)
Bakelite Hylam Ltd, Hyderabad	Dr C. S. Narasimhan Dr M. Balakrishnan (*Alternate*)
Building Materials and Technology Promotion Council, New Delhi	Shri J. Sengupta
Central Institute of Plastics Engg and Technology, Chennai	Dr Vijai Kumar Dr K. Palanivelu (*Alternate*)
Central Food Technological Research Institute, Mysore	Shri S. K. Kumar Shri Baldev Raj (*Alternate*)
Gas Authority of India Ltd, Noida	Shri Shivaji Basu Shri V. K. Singh (*Alternate* I) Shri Manish Khandelwal (*Alternate* II)
Gharda Chemicals Ltd, Thane	Dr B. K. Desai Dr U. M. Vakil (*Alternate*)
GE Plastics India Limited, Gurgaon	General Manager Dr (Shrimati) Rashmi Bhardwaj (*Alternate*)
Gujarat State Fertilizers Company Limited, Vadodara	Shri B. D. Adhvaryu Dr Y. P. Singh (*Alternate*)
Haldia Petrochemicals Ltd, Kolkata	Shri Shankar Banerjee Shri Amitava Sanyal (*Alternate*)
Hindustan Polymers Ltd, Mumbai	Shri S. V. Parveen Shri N. C. Dhocendranath (*Alternate*)
Indian Centre for Plastics in Environment, Mumbai	Dr A. N. Bhat
Indian Petrochemicals Corporation Limited, Vadodara	Shri J. B. Kamat Shri V. C. Francis (*Alternate*)
Indian Plastics Institute, Mumbai	Shri D. R. Patel Shri R. K. Aggarwal (*Alternate*)
Indian Institute of Packaging, Mumbai	Shri P. V. Narayanan Dr N. G. Mokashi (*Alternate*)
Indian Toxicological Research Centre, Lucknow	Dr V. P. Sharma
Jain Irrigation Systems Ltd, Jalgaon	Dr H. C. Mruthyunjaya Shri S. B. Joshi (*Alternate* I) Shri A. P. Choudhari (*Alternate* II)
Larsen & Toubro Ltd, Mumbai	Shri V. Mohan Shri R. Suba Rao (*Alternate*)
Ministry of Defence (R&D), Kanpur	Shri M. N. Saraf Dr L. D. Khandpal (*Alternate*)
Ministry of Railways, RDSO, Lucknow	Joint Director (Rubber) Director (SS) (*Alternate*)
Ministry of Health and Family Welfare, DGHS, New Delhi	Additional Director General (PFA) Shri Sundar Lal (*Alternate*)
Ministry of Food Processing Industries, New Delhi	Shri O. P. Gera
National Chemical Laboratory, Pune	Dr S. S. Mahajan Dr S. S. Kulkarni (*Alternate*)
National Dairy Development Board, Anand	Dr R. S. Lathana Shri S. K. Khandelwal (*Alternate*)
National Organic Chemical Industries Ltd, Mumbai	Shri V. K. Sharma Shri J. K. Vadodaria (*Alternate*)
Nuchem Ltd, Faridabad	Dr R. M. Mehta
Permali Wallace Ltd, Bhopal	Shri C. C. Sakarda Shri S. K. Kodesia (*Alternate*)

(*Continued on page* 9)

(*Continued from page* 8)

Organization	*Representative(s)*
Plastics & Linoleums Export Promotion Council, Mumbai	Shri R. P. Kalyanpur
Reliance Industries Ltd, Mumbai	Dr Y. B. Vasudeo Dr K. S. Jadhav (*Alternate*)
Saint-Gobain Vetrotex India Ltd, Hyderabad	Shri S. Sundaram Shri S. K. Ghosh (*Alternate* I) Dr B. J. C. Basu (*Alternate* II)
Shivalik Agro-Poly Products Ltd, Parwanoo, H.P.	Shri Arun Anand Shri Yog Raj Kapur (*Alternate*)
Shriram Fertilizers & Chemicals, Kota	Shri M. S. Tripathi Shri R. C. Gupta (*Alternate*)
Shriram Institute for Industrial Research, Delhi	Dr R. C. Sood
Supreme Petrochem Ltd, Mumbai	Shri R. Rangarajan Shri B. A. Rakhangi (*Alternate*)
Tata Engg & Locomotive Co Ltd, Jamshedpur	Shri U. K. Nath Shrimati A. D. Sathe (*Alternate*)
VIP Industries, Mumbai	Shri Siddhartha Roy Shri A. S. Dalve (*Alternate*)
XPRO India Ltd, Faridabad	Shri C. Bhaskar Shri Manmohan Krishan (*Alternate*)
BIS Directorate General	Shri Anjan Kar, Director & Head (PCD) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri T. Kalaivanan
Joint Director (PCD), BIS

Thermoplastics Subcommittee, PCD 12 : 3

Reliance Industries Ltd, Mumbai	Dr Y. B. Vasudeo (***Convener***)
All India Plastic Industries Association, Delhi	Shri D. Jain
All India Plastics Manufacturers' Association, Mumbai	Shri A. K. Mukherjee Shri Umakant A. Shah (*Alternate*)
Bhor Industries Ltd, Mumbai	Shri V. V. Amdekar Dr V. S. Joshi (*Alternate* I) Shri S. V. Charya (*Alternate* II)
Caprihans (India) Pvt Ltd, Mumbai	Shri M. K. Datta Ray Dr S. V. Peddada (*Alternate*)
Central Institute of Plastics Engineering & Technology, Chennai	Dr R. Janardhan Shri S. K. Chattopadhyay (*Alternate*)
Colour-Chem Limited, Mumbai	Shri S. S. Kulkarni
GE Plastics India Ltd, Vadodara	Shri P. V. Murli Mohan Dr Gopal Majumdar (*Alternate*)
Gujarat State Fertilizers Co Ltd, Vadodara	Shri B. D. Adhvaryu Dr Y. P. Singh (*Alternate*)
Haldia Petrochemicals Ltd, Kolkata	Shri Amitava Sanyal Shri Raj Datta (*Alternate* I) Shri R. L. Wadhwa (*Alternate* II)
Hindustan Fluoro Carbon Ltd, Hyderabad	Dr P. S. Das
Hindustan Polymers Ltd, Mumbai	Shri S. S. Anand Shri A. K. Mukherjee (*Alternate*)
Indian Petrochemicals Corporation Ltd, Vadodara	Shri J. B. Kamat Shri V. C. Francis (*Alternate*)
Ministry of Defence (DGI), Kanpur	Dr S. P. Singh Shri Girish Trivedi (*Alternate*)

(*Continued on page* 10)

(*Continued from page* 9)

Organization	*Representative(s)*
Ministry of Defence (R&D), Kanpur	DR L. D. KHANDPAL DR R. K. SINGH (*Alternate*)
National Organic Chemicals Industries Ltd, Mumbai	SHRI J. K. VADODARIA SHRI V. K. SHARMA (*Alternate*)
Sriram Fertilizers & Chemicals, Kota	SHRI M. S. TRIPATHI SHRI R. C. GUPTA (*Alternate*)
Supreme Petrochem Ltd, Mumbai	SHRI R. RANGARAJAN
Unnati Industries, Ahmedabad	SHRI M. C. PALIWAL SHRI JANAK G. NANAVATY (*Alternate*)
XPRO India Ltd, Faridabad	SHRI C. BHASKAR SHRI RAVI KUMAR (*Alternate*)

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications: No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publication), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc: No. PCD 12 (1567).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 323 01 31, 323 3375, 323 94 02

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	323 76 17, 323 38 41
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	337 84 99, 337 85 61 337 86 26, 337 91 20
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43 60 20 25
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	254 12 16, 254 14 42 254 25 19, 254 13 15
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	832 92 95, 832 78 58 832 78 91, 832 78 92
Branches	: AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.	

Printed at Simco Printing Press, Delhi